



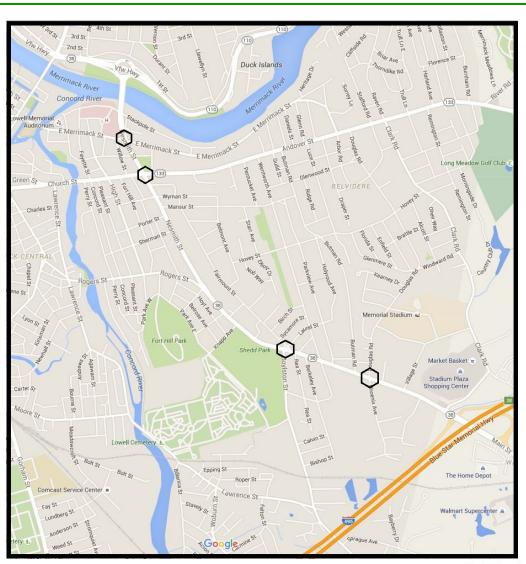
**Massachusetts Department of Transportation** 

## Route 38 Roadway and Intersection Improvements

Lowell, MA

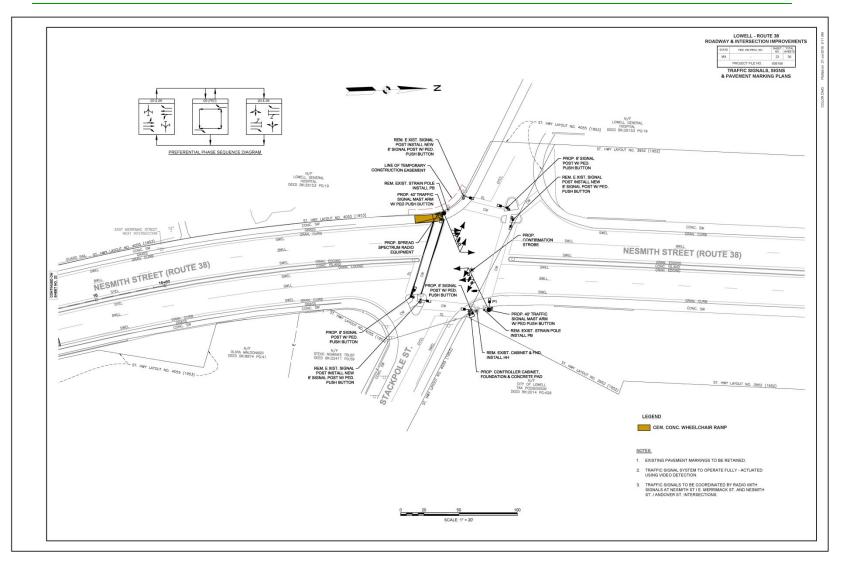
25% Design Public Hearing

July 28, 2016





# Route 38 at Stackpole Street





## Route 38 @ Douglas Street/Phoenix Avenue

- Description of existing condition
- 4-way intersection under traffic signal control
- Route 38/2 approach lanes each direction
- Phoenix/thru-left lane and separate tight turn lane
- Douglas Street/1 approach lane
- Pedestrian crossing only on two of the four approach
- Signal phasing includes a southbound protected lead phase

#### Traffic volumes

- Route 38 peak hour volumes: 1400 v/AM and 1800 v/PM
- Directional distribution: 60% SB in AM and 53% NB in PM

#### **Accident history**

- Jan 2006 to Oct 2009...8 crashes /// Jan 2011 to Dec 2013...21 crashes
- Crashes were equally split between angle-type and rear-end type
- Crash rate: 0.66 A/MEV (District Average = 0.77 A/MEV)



## Route 38 @ Douglas Street/Phoenix Avenue - Continued

- Deficiencies (RSA & Current Project)
- Inadequate pedestrian crossing accommodations
- Deteriorated signage and pavement markings
- Check Route 38 SB approach for limited visibility of traffic signals
- LOS Analyses

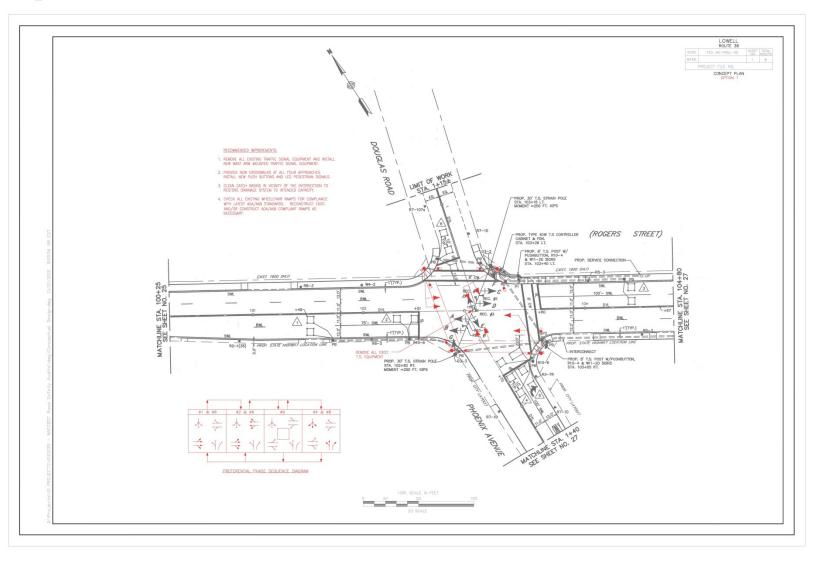
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- Existing: B/14.5 sec AM.....B/12.8 sec PM
- Future: B/15.4 sec AM.....B/13.3 sec PM
- Alternatives (MassDOT & Designer)
- Option 1
- Option 2

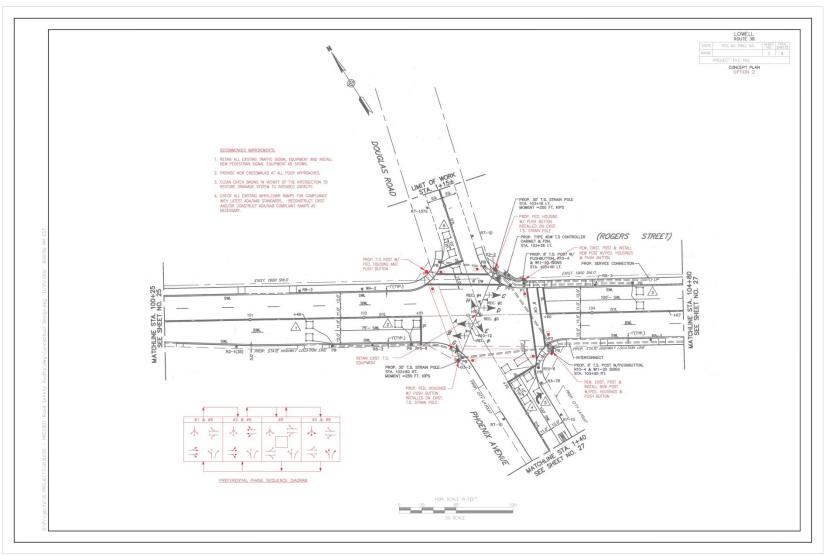


# Douglas St. / Phoenix Ave. – Option 1





# Douglas St. / Phoenix Ave. – Option 2







- Description of existing condition
- 4-way intersection under traffic signal control
- Boylston Street intersects Route 38 at right angle.
- Fairmount Street also intersects Route 38 at right angle but is intersected by Laurel Street a short distance away. Laurel Street traffic merges with Fairmount Street traffic to form single lane approach at signals.
- Two channelizing islands separate the intersection that prevents Route 38 NB traffic direct access to Fairmount Street.
- Route 38 NB: Thru/Right lane & left lane
- Route 38 SB: Thru/Left lane & right lane
- Boylston Street & Fairmount Street: one general lane
- Exclusive pedestrian crossing of all approaches
- Signal phasing includes a northbound protected lead phase



#### Route 38 @ Boylston Street/Fairmount Street/Laurel Street (Cont.)

#### **Traffic volumes**

- Route 38 peak hour volumes: 1400 v/AM and 2,000v/PM
- Directional distribution: 59% SB in AM and 54% NB in PM
- Accident history
- Jan 2006 to Oct 2009...31 crashes /// Jan 2011 to Dec 2013...27 crashes
- Approximately 50% of the crashes are rear-end type, and approximately 50% of these are in SB direction and another 10% NB.
- Approximately 13% of crashes are angle type involving left turn vehicles
- Crash rate: 0.78 A/MEV (District Average = 0.77 A/MEV)
   Deficiencies (RSA & Current Project)
- Deteriorated signage and pavement markings
- Deteriorated and outdated traffic signal equipment
- Inadequate capacity at Boylston Street approach



#### Route 38 @ Boylston Street/Fairmount Street/Laurel Street (Cont.)

#### **Analyses**

- Existing: C/23.4 sec AM.....F/82.6 sec PM
- Future: C/25.9 sec AM.....F/116.4 sec PM

### **Alternatives (MassDOT & Designer)**

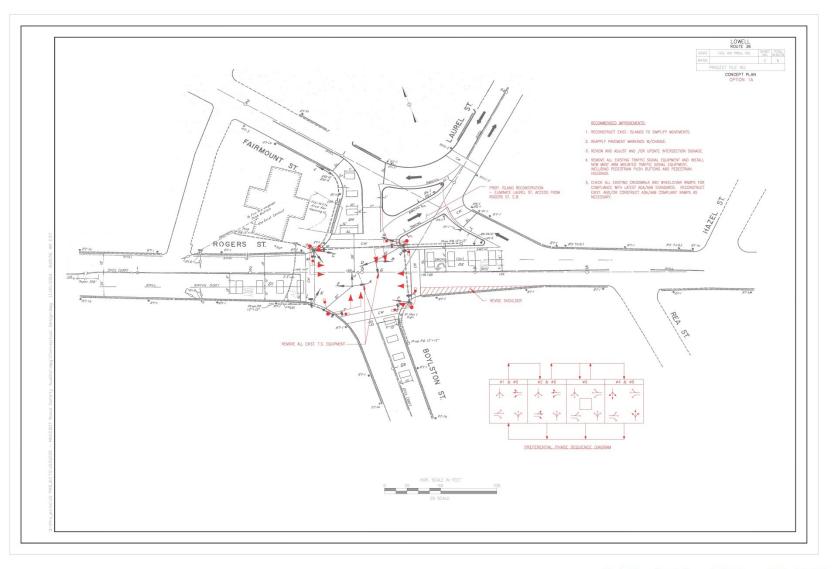
- Option 1A & 1A (Modified)
- Option 1B
- Option 2
- Option 3

#### **Selected Alternative**

- Option 1A (Modified)
- Analyses:
- Option 1A: C/22.7 sec AM.....F/145.0 sec/PM
- Option 1A (Modified): C/22.6 sec AM......D/53.4 sec PM

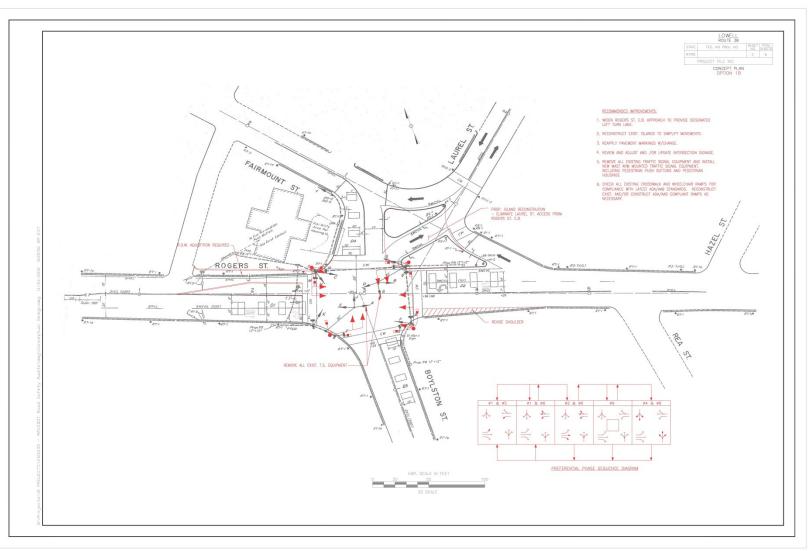


# Boylston St./Fairmount St. - Option 1A



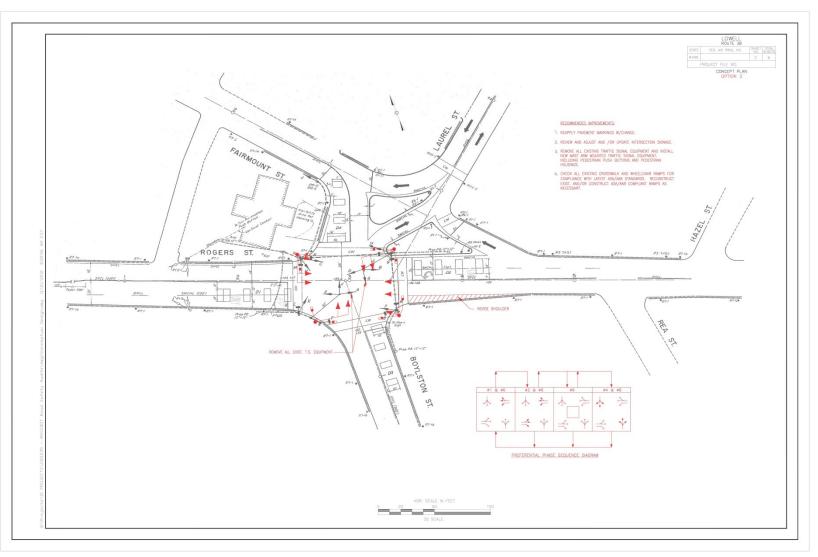


# Boylston St./Fairmount St. - Option 1B



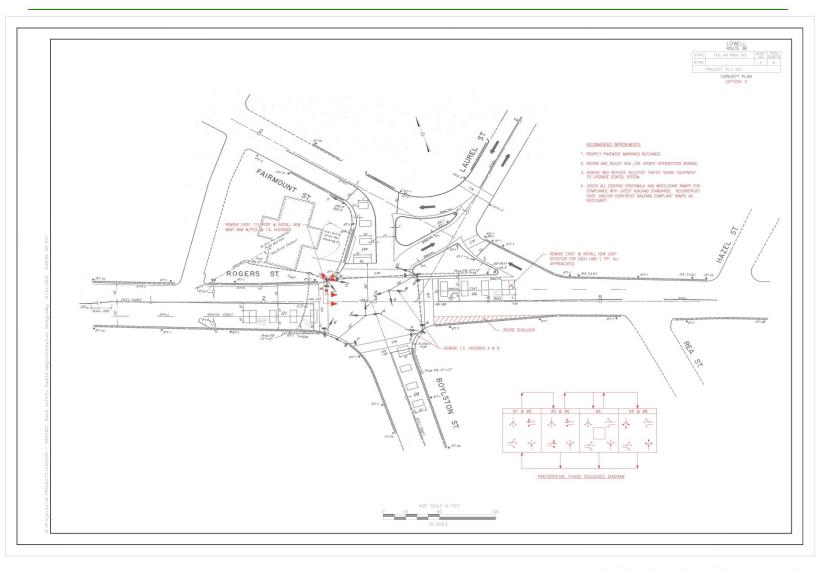


# Boylston St./Fairmount St. - Option 2





# Boylston St./Fairmount St. - Option 3





## Route 38 @ Andover Street

### **Description of existing condition**

- 4-way intersection under traffic signal control
- Route 38 consists of thru/right and designated left lane both NB & SB
- Andover Street WB consists of shared left/thru lane and designated right lane
- Andover Street EB consists of designated left lane and shared thru/right lane
- Exclusive pedestrian crossing of all approaches
- Signal phasing includes a southbound protected lead phase that includes a right turn overlap for Andover Street WB

#### **Traffic volumes**

- Route 38 peak hour volumes: 1,300 v/AM and 1,400v/PM
- Route 38 SB left turns and Andover Street WB right turns are extremely heavy during both morning and evening peaks
- Directional Distribution: 55% SB in AM and 54% NB in PM





### **Accident history**

- Jan 2006 to Oct 2009...44 crashes /// Jan 2011 to Dec 2013...
   50 crashes
- Approximately 50% of crashes were angle type and 25% of crashes were rear-end type
- Crash rate: 1.06 A/MEV (District Average = 0.77 A/MEV)

#### **Deficiencies (RSA & Current Project)**

- Deteriorated pavement markings
- Excessive signage
- Narrow roadway cross section
- Utility pole locations contribute to safety concerns



## Route 38 @ Andover Street - Continued

## **Analyses**

- Existing: E/55.5 sec AM......F/91.9 sec PM
- Future: C/70.3 sec AM.....F/115.4 sec PM

### **Alternatives (MassDOT & Designer)**

- Option 1
- Option 2
- Option 3
- Option 4
- Option 5A
- Option 5B

#### **Selected Alternative**

- Option 3
- o Analyses:
- Option 3: D/42.3 sec AM.....E/71.9 sec/PM



### Route 38 @ E Merrimack Street

### **Description of existing condition**

- 4-way intersection under traffic signal control
- Route 38 consists of two lanes in each direction. The NB inner lane is utilized almost exclusively as a left turn lane.
- E Merrimack Street WB is a single general purpose lane
- E Merrimack Street EB consist of an exclusive left turn lane and a thru/right turn lane
- Exclusive pedestrian crossing of all approaches
- Signal phasing includes a northbound protected lead phase

#### **Traffic volumes**

- Route 38 peak hour volumes: 2,200 v/AM and 2,200v/PM
- Route 38 NB left turns are extremely heavy during the morning peak
- Directional distribution: 57% SB in AM and 56% NB in PM
- Option 3: D/42.3 sec AM.....E/71.9 sec/PM





### **Accident history**

- Jan 2006 to Oct 2009...22 crashes /// Jan 2011 to Dec 2013...
   28 crashes
- Approximately 50% of crashes were angle type and 23% of crashes were rear-end type
- Crash rate: 0.65 A/MEV (District Average = 0.77 A/MEV)

#### **Deficiencies (RSA & Current Project)**

- Deteriorated pavement markings
- Vehicles queue such that they block intersection
- Outdated traffic signal equipment
- Stairs exiting directly into travel lanes with no protection for pedestrians



## Route 38 @ E Merrimack Street - Continued

## **Analyses**

- Existing: D/39.8 sec AM.....E/72.2 sec PM
- Future: D/52.6 sec AM......F/81.3 sec PM

#### **Alternatives (MassDOT & Designer)**

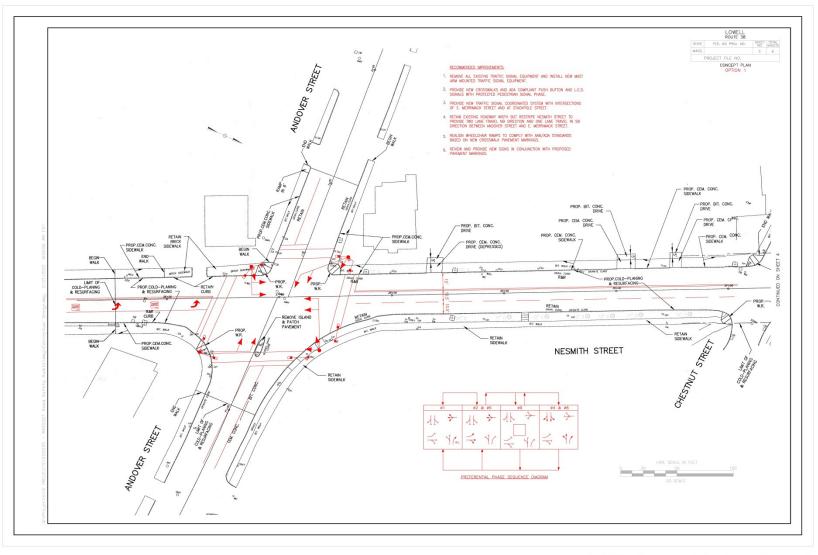
- Option 1
- Option 2
- Option 3
- Option 4
- Option 5A
- Option 5B

#### **Selected Alternative**

- Option 3
- o Analyses:
- Option 3: C/34.6 sec AM.....E/55.4 sec/PM

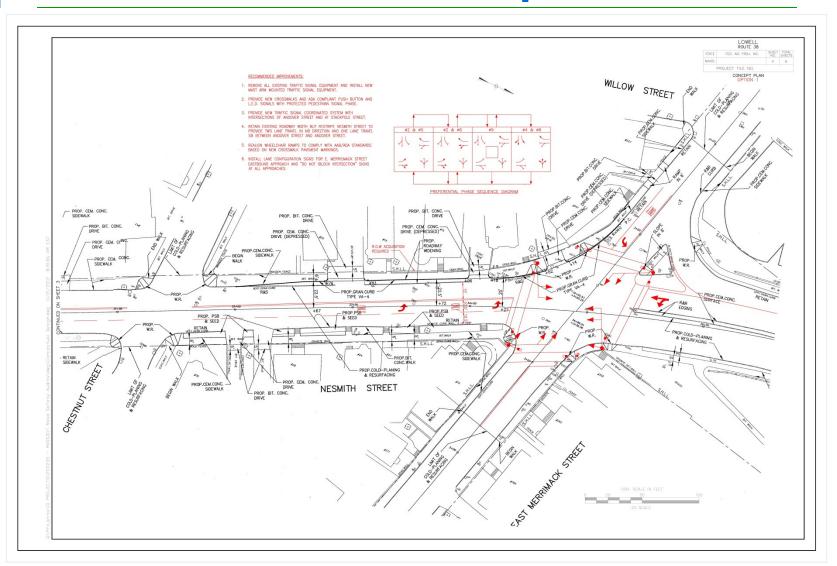


# **Andover Street - Option 1**



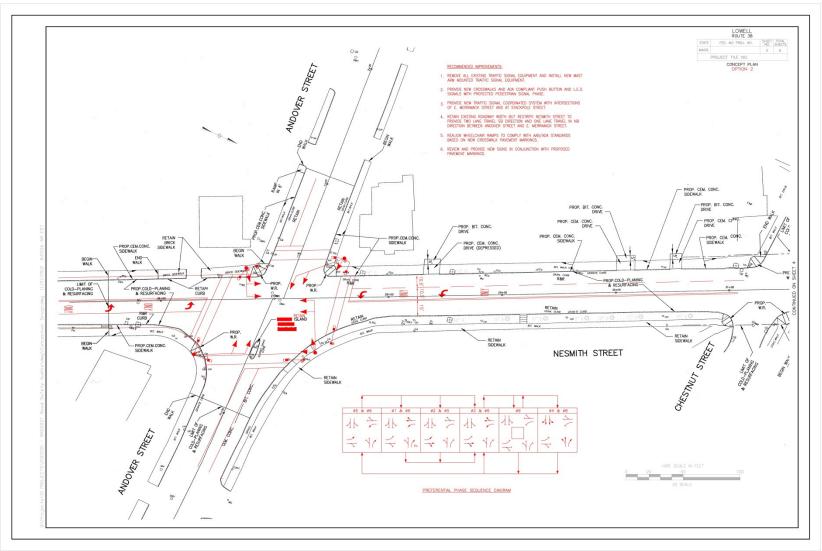


## E. Merrimack Street - Option 1



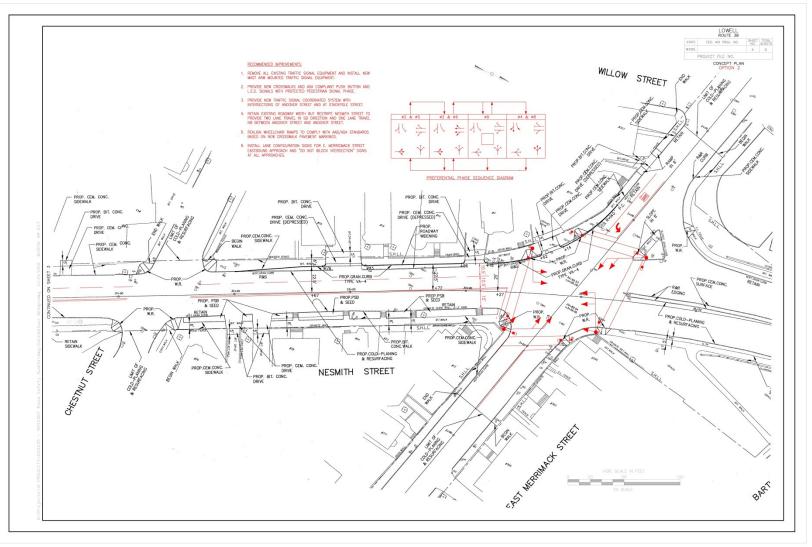


# **Andover Street - Option 2**



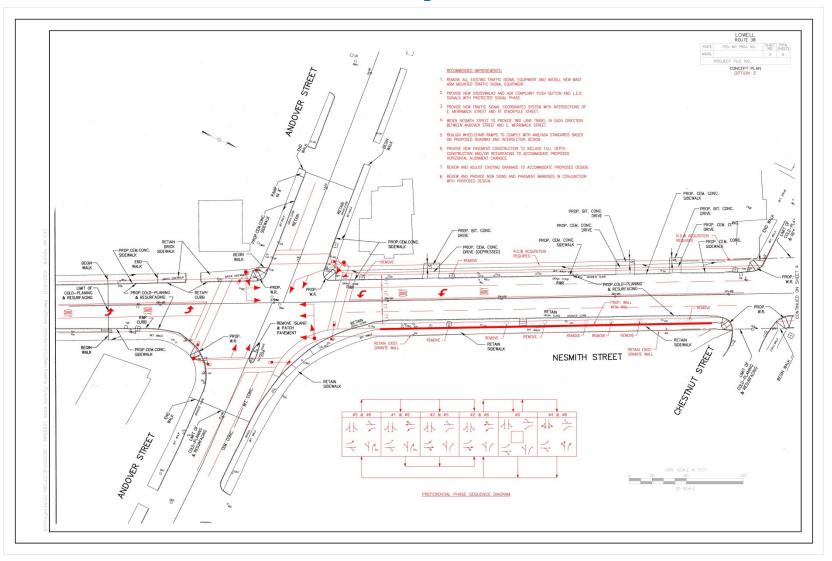


# E. Merrimack Street - Option 2



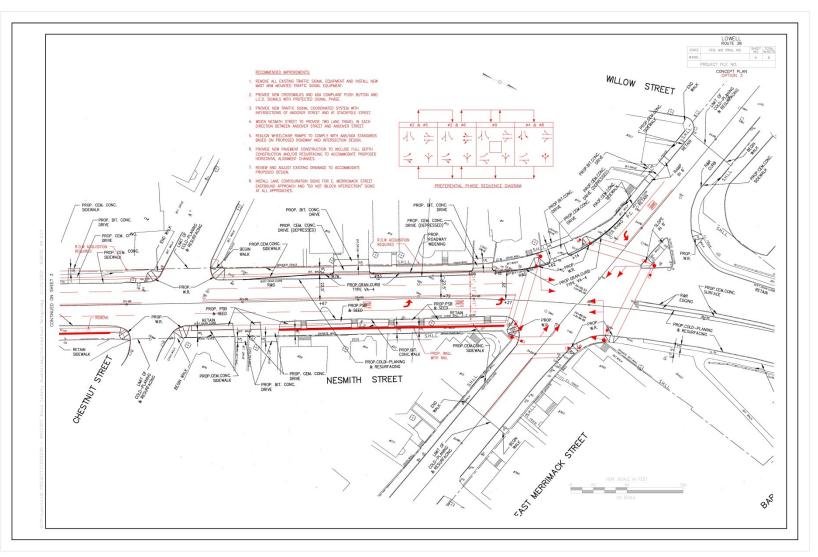


## **Andover Street - Option 3**



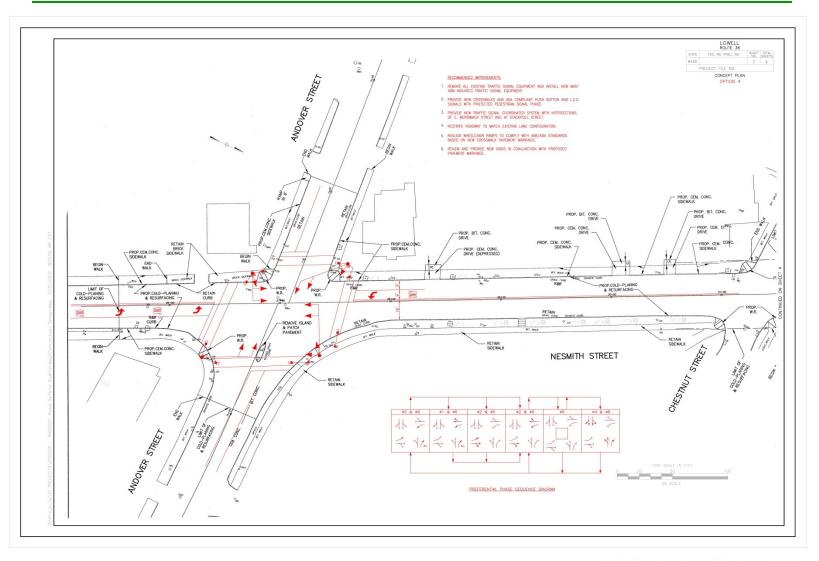


# E. Merrimack Street - Option 3



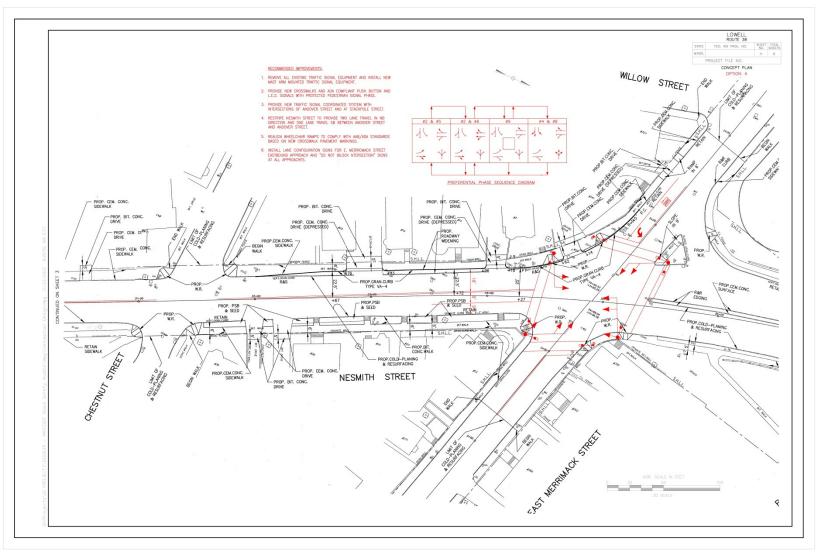


## **Andover Street - Option 4**



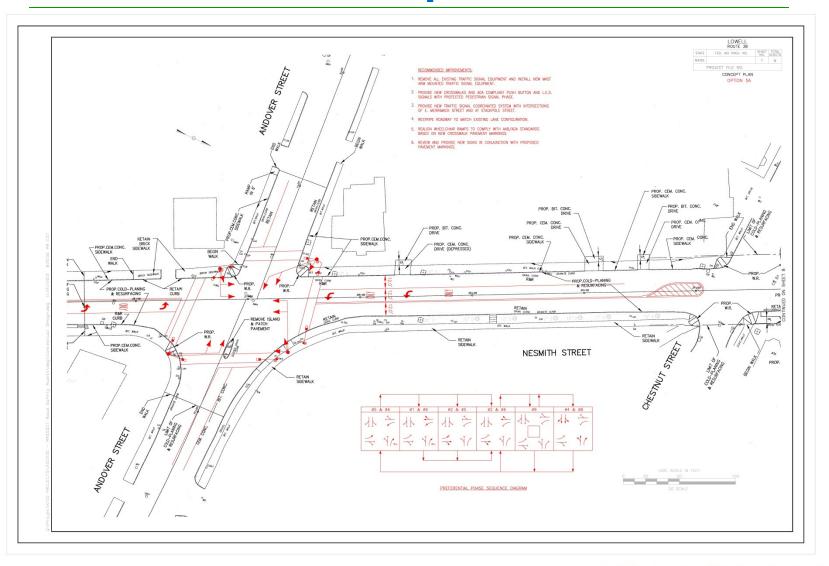


# E. Merrimack Street - Option 4



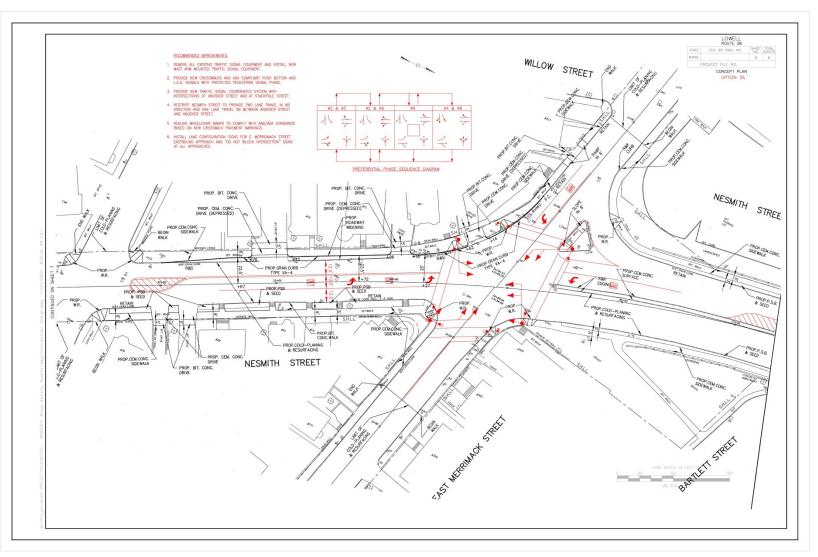


# **Andover Street - Option 5A**



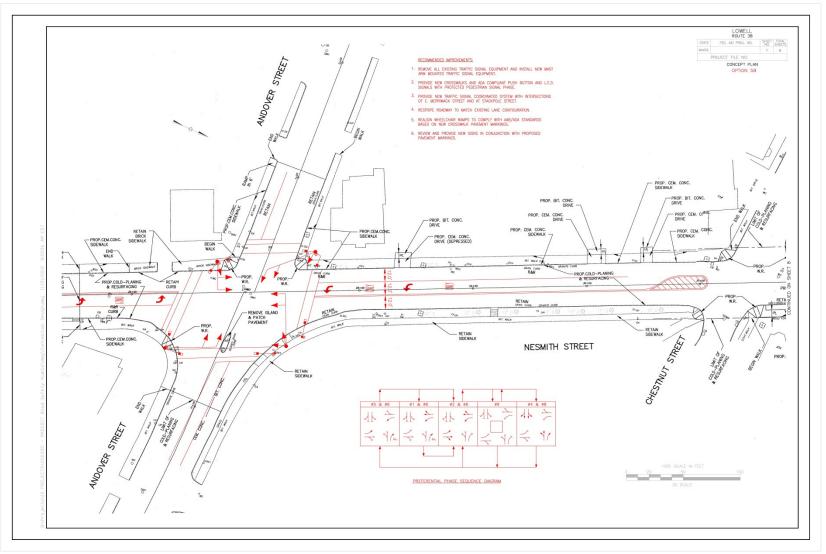


# E. Merrimack Street - Option 5A



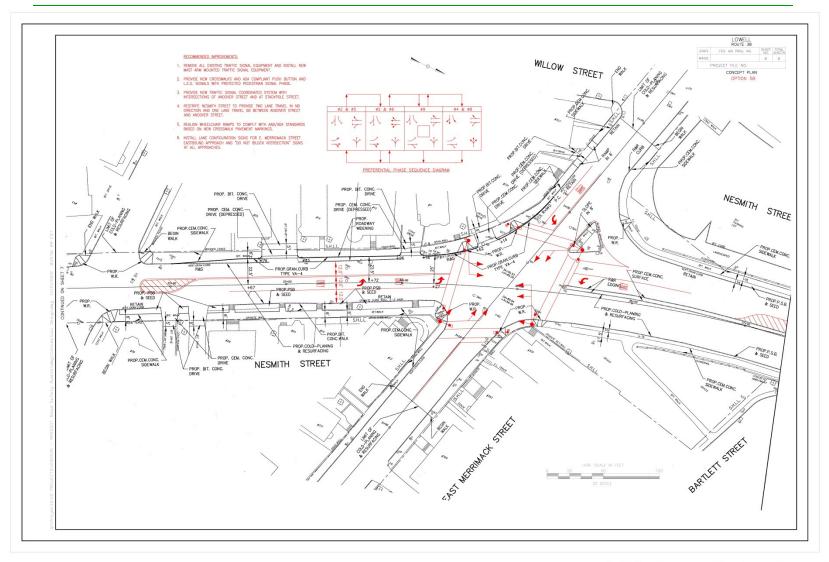


# **Andover Street - Option 5B**

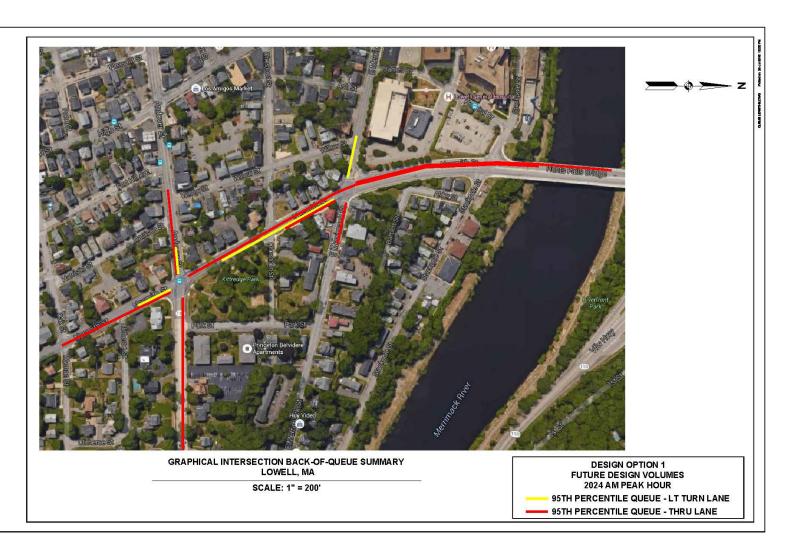




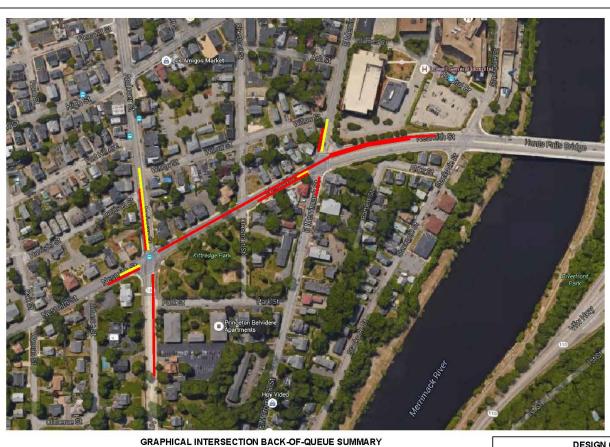
## E. Merrimack Street - Option 5B











LOWELL, MA

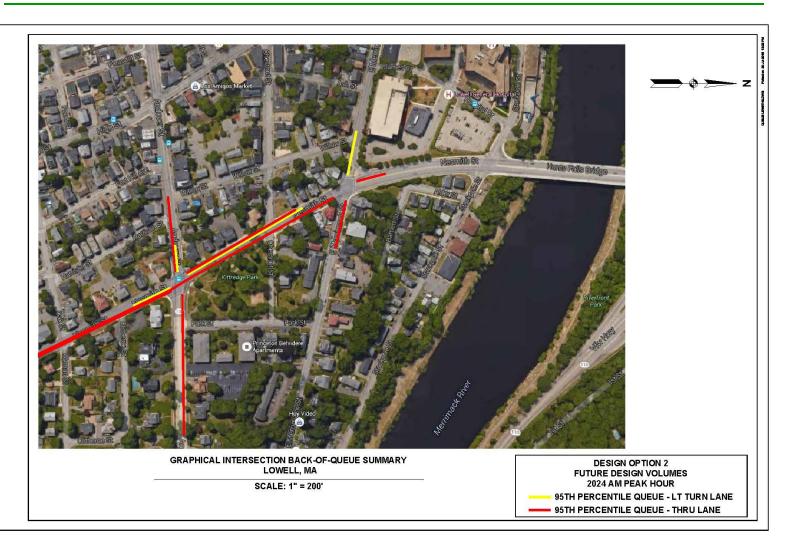
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DESIGN OPTION 1
FUTURE DESIGN VOLUMES

2024 PM PEAK HOUR 95TH PERCENTILE QUEUE - LT TURN LANE

- 95TH PERCENTILE QUEUE - THRU LANE

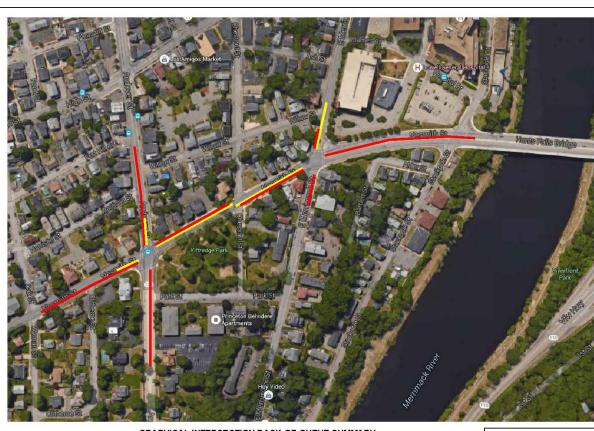














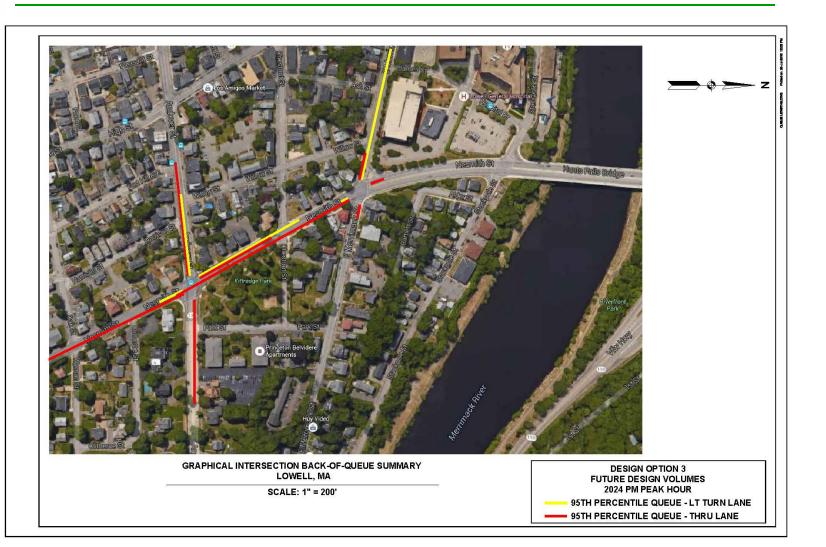
GRAPHICAL INTERSECTION BACK-OF-QUEUE SUMMARY LOWELL, MA

SCALE: 1" = 200'

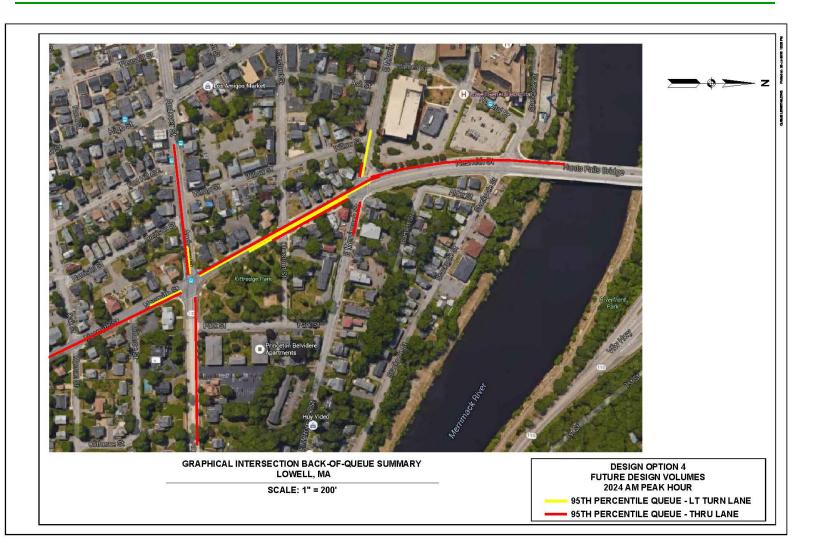
DESIGN OPTION 3 FUTURE DESIGN VOLUMES 2024 AM PEAK HOUR

95TH PERCENTILE QUEUE - LT TURN LANE
5TH PERCENTILE QUEUE - THRU LANE

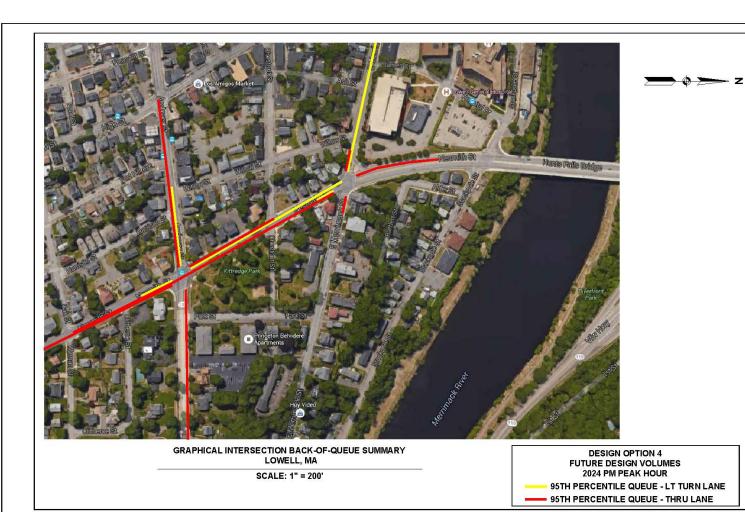
















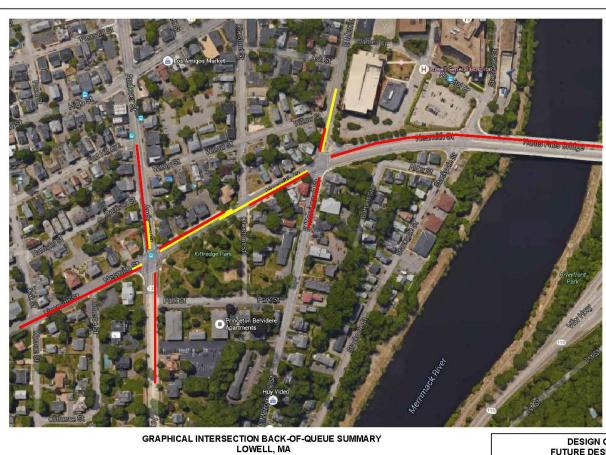


95TH PERCENTILE QUEUE - THRU LANE





95TH PERCENTILE QUEUE - THRU LANE



SCALE: 1" = 200'

DESIGN OPTION 5B FUTURE DESIGN VOLUMES 2024 AM PEAK HOUR

95TH PERCENTILE QUEUE - LT TURN LANE

- 95TH PERCENTILE QUEUE - THRU LANE





SCALE: 1" = 200'

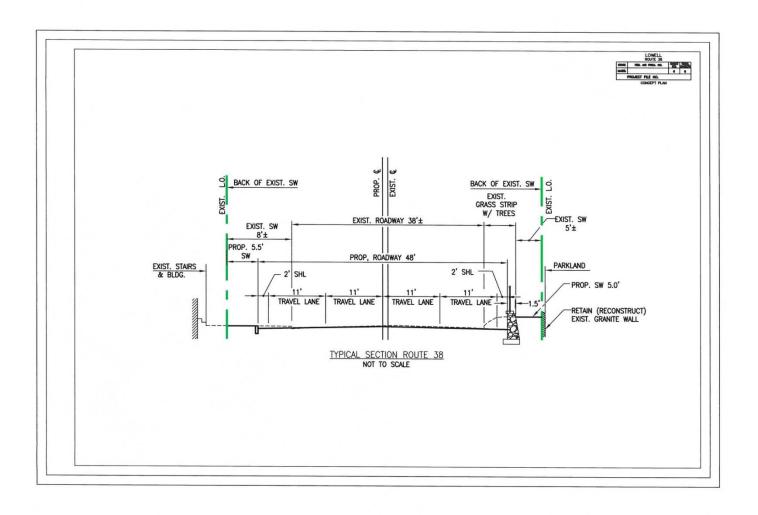
DESIGN OPTION 5B FUTURE DESIGN VOLUMES 2024 PM PEAK HOUR

95TH PERCENTILE QUEUE - LT TURN LANE

- 95TH PERCENTILE QUEUE - THRU LANE

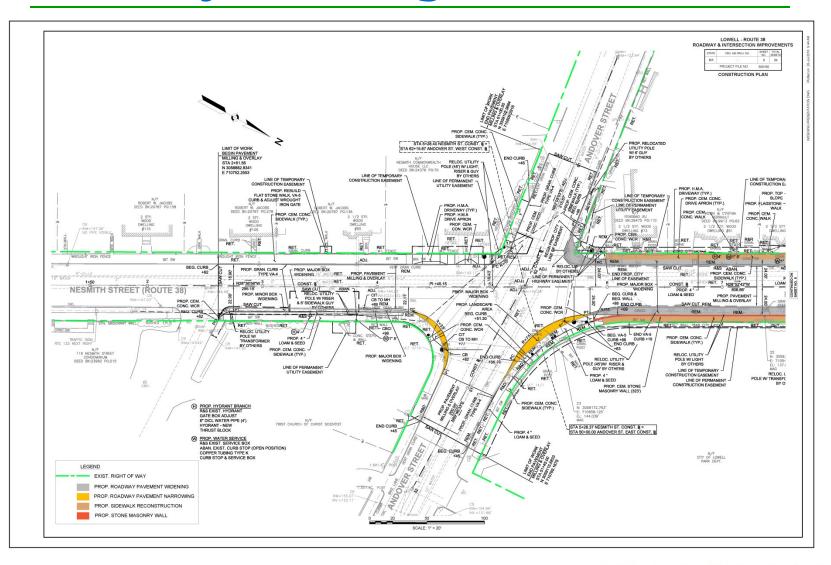


# **Route 38 - Typical Section**



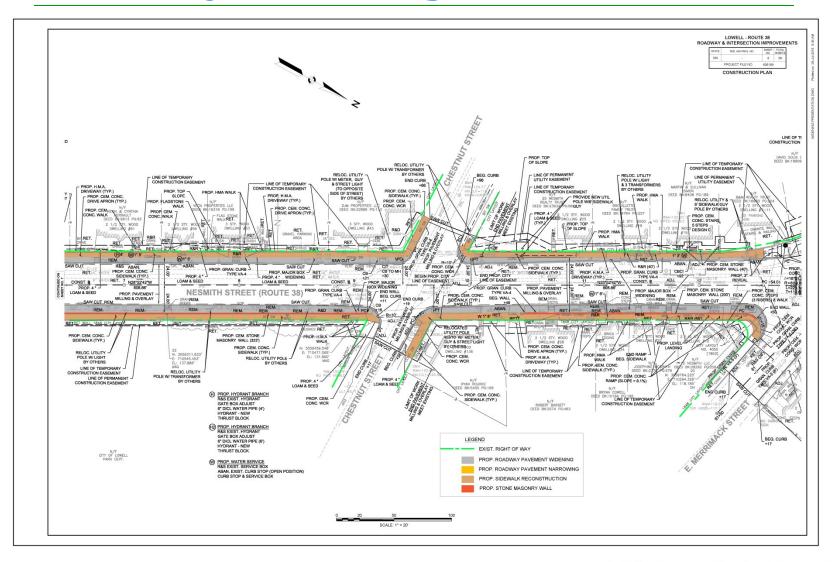


# **Roadway Widening**





## **Roadway Widening**





# **Roadway Widening**

